

## BOOK REVIEW

RICARD SOLÉ and BRIAN GOODWIN, 2000. **Signs of Life: How Complexity Pervades Biology.** (ISBN 0-465-01928-5, pbk.). Basic Books, 387 Park Avenue South, New York, NY 10016, U.S.A. (**Orders:** 212-340-8100, 212-340-8115 fax; www.basicbooks.com). \$17.50, 322 pp., b/w figures, charts, notes, index, 6" × 9 1/4".

The book *Signs of Life* addresses the concept of complexity in biology. To completely appreciate this text, readers should have a strong background in mathematics, physics, biology and if possible systems modeling. Such a foundation is helpful in understanding the many mathematical equations that the reader is presented with during the authors' discussions. The vocabulary of this book is advanced; I found it necessary to look up words and theory references either in a dictionary or online. The language and terminology choices in the text are much more involved than the back cover description would lead you to believe. In fact, the writing style and vocabulary choices used in this book will likely discourage, if not exasperate, most readers.

The first chapter serves as an overview of the book, which this reader found too mathematically/physics intensive (i.e. technically term laden) to get a good foothold on the examples and messages the authors were attempting to convey. A number of topics relating to nonlinearity, chaos and emergence were discussed in chapter one; some explained and some not, including: Lorenz attractors, Navier-Stokes equations, excitable media, slime mold life cycle, Bernard cells, bifurcation, and convection.

The second chapter focused on order, complexity and disorder. Although heavy on the physics and math, this chapter was understandable. The chapter discusses the Ising model, which was initially explained with magnetic attractor changes at extreme temperatures. The Ising model was carried into examples of fire spread, sandpile shape, and discussion of critical limits in various biological and physical systems.

Chapter three centered on the topics of genetic networks and what processes control cell differentiation and genetic development. Items discussed included the ideas of rate limiting steps, isologous diversification and gene regulation of metabolic activities.

My initial interest and excitement about this book arose from both the title and description on the back. That interest was quickly replaced with frustration after the continual exposure to advanced mathematics, physics terminology and equations, and I stopped reading after chapter three. Additional chapter titles include: Brain Dynamics, Ants, Brains & Chaos, Baroque of Nature, Life on the Edge of Catastrophe, Evolution & Extinction, Fractal Cities, and Market Crashes. I am sure that readers more familiar or comfortable with the many theories and equations referenced in this book will be able to glean a wealth of knowledge and interesting relationships included by the authors.

The book *Signs of Life* covers the topic of complexity in biology. The authors have included many "boxes" within the text that offer readers an in-depth mathematical equation, chart, graph or mathematical analysis related to the topics discussed. Each chapter also has a references area for those readers who wish to learn more or read specific source material. Unfortunately the authors' use of extremely technical terminology and verbose writing style, make understanding complexity in biology very complex itself. —Lee Luckeydow, Herbarium, Botanical Research Institute of Texas, 509 Pecan Street, Fort Worth, TX 76102-4060, U.S.A